howitworks

THE MECHANICS OF HOME BUILDING

Circular

Despite having no moving parts, circular sawblades are surprisingly complex. The common carbide-tooth sawblade has to make three kinds of cuts at once: the cut into the material, the cut through the material, and the cut on the way out of the material. Through the engineering of the saw plate and teeth, the blade is able to perform each of these three cuts.

The wrong blade may still make the cut, but it won't necessarily make it well or make it repeatedly without failing. Here's how circular sawblades work.

Justin Fink is Project House editor.

Saw plate Laser-cut to shape and then heat-treated, ground, and hammered, a good steel saw plate is the foundation for a quality finished blade. Plate thickness varies in proportion to the size, number, and design of the teeth, but it typically is in the neighborhood of 0.020 in. to 0.025 in. (less than 1⁄32 in.) thinner than the width of the teeth attached to the saw plate's outer edge.

Chip limiter These small horns—located behind each tooth or after several—are added to certain blades to limit the amount of bite that each tooth takes, which reduces the chances of kickback.

Expansion slot As sawblades cut a kerf through wood, they create enough heat to cause the saw plate to expand. Slots cut into the saw plate dissipate the heat and provide room for expansion so that the blade won't warp. The slots are usually terminated with a rounded end to eliminate the chance of stress cracks, and they often are filled with plastic or a soft metal such as copper to reduce noise as the blade spins.

Coating More than window dressing, the Teflon-like coatings used on many sawblades are designed to reduce friction, to prevent wood resin from sticking to the saw plate, and to help make the blade easier to clean.

Tooth count The number of teeth on a sawblade contributes to the speed and smoothness of the cut. Fewer teeth provide faster cuts with rougher results, while more teeth cause blades to cut more slowly but with finer results.

Vibration dampeners Vibration, which can come from the saw itself and from contact with the material being cut, causes the blade to wobble from side to side, which contributes to tooth wear, creates additional heat, and leads to inferior cuts. To dampen this vibration, manufacturers laser-cut various patterns through the middle of the saw plate. The presence of a good antivibration design is revealed by knocking the saw plate with a hammer; if it rings, it will vibrate.

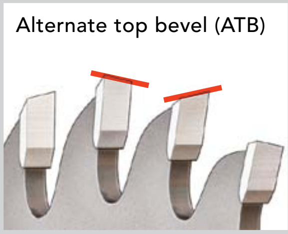
Gullet Acting as a sort of storage compartment, the gullet is where the wood that's removed from the kerf is held until the blade rotates out of the cut and releases the waste. The gullets are curved to retain strength, and sized based on the type of cut and amount of material that each tooth has to handle. For example, a blade with relatively few teeth means that each tooth is cutting more material, so the gullets are large.

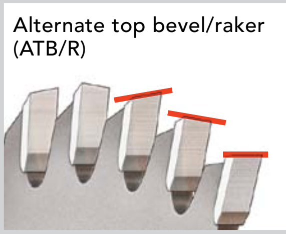
Photos: Rodney Diaz. Drawings: Christopher Mills.

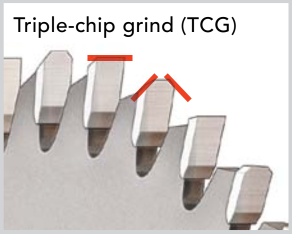
sawblades

BY JUSTIN FINK

Tooth grind The shape of the sawblade's teeth, particularly along its top cutting edge, determines how it cuts material. The grind on each tooth of a given blade may be identical, or it may be a mixture of different grinds, designed to work in concert. There are numerous variations to the type, shape, size, and angle of the teeth, but the most common grinds are flat, beveled, and chamfered.







Flat This squared-off shape makes teeth extremely durable and resistant to fracturing, but it's designed to chip away at the wood, so it's not known for clean cuts. Flat-ground teeth are typically found on blades designed to cut along the grain (rip cut), where cutting speed is the top priority. But flat-ground teeth also play a supporting role on blades that include other, more specialized teeth.

Beveled If a flat-ground tooth is a spoon, a beveled tooth is a knife. Rather than grabbing and pulling its way through the material with a digging action, it cuts with a slicing action. Beveled teeth are usually set at opposing angles so that one tooth shaves through the right side of the kerf and the other shaves through the left side. Sometimes this beveled sequence is followed by a single flat-ground tooth (called a *raker*) to clear away the V-shape waste left by the beveled teeth. This ATB/R configuration, found on what are often called combination blades, leaves clean results along both cut edges. The steeper the angle of the bevel, the cleaner the edges and faces of the cut, but also the faster the teeth will dull.

Chamfered These teeth are designed to survive in dense materials—tropical hardwoods, laminate counters, nonferrous metals, and so on—that would dull other grinds quickly. Chamfered teeth are usually combined with flat-ground teeth. The high, flat center of the chamfered tooth creates the first chip, leaving the sides for the flat-ground tooth that follows behind it.

Clearance angles

As you cut through wood, its fibers heat up, expand, and create friction as the blade passes. To reduce this friction, the tops, sides, and backs of teeth are often ground at a slight angle to provide clearance as they pass through the cut. On some blades, even the shoulders behind the teeth are ground for additional relief.

Hook angle

The amount of forward or backward lean on a tooth determines how it enters the wood. Measured in relation to the centerpoint of a blade, a higher hook angle bites more aggressively—a desirable trait in a rip cut—while low or negative angles offer more control, which is desirable when cutting trim on a miter saw.